x in.	y in.	Mag. m	Star.	B.A.C.
71·42	1·99	4·3	70 Ophiuchi	6123
·53	0·86	cl.	..	(6012)
·62	1·59	5	66 „	6089
·62	5·36	3	λ Aquilæ	6526
·87	6·04	5·7	*f* „	6614
·95	2·58	5	74 Ophiuchi	6227
71·98	6·91	5	κ Aquilæ	6713

Corrigenda.

Page 7	*x*	6·20	17 Lyræ, B.A.C. 6553
8		8·84	T Cygni, not τ
9		12·02	*y* 6·86 instead of 6 87
		14·93	β Cephei, ·93 dropped out
10		17·51	dele mag. 5·3
11		20·45	cl. vi. 33 = *h* Persei
		20·52	cl. vi. 34 = χ „
		20·74	5 H Camelop., not 9 H
12		25·28	*o* Persei, not θ
		28·08	*y* 3·89 instead of 3·49
		28·13	16 Aurigæ instead of 14
13		32·67	Mag. 4·7 instead of 5
		34·35	B.A.C. 1684 instead of 1730
		34·38	B.A.C. 2126 instead of 1684

5 line 25, read P.D. instead of Decl.

Note on Mr. Crossley's Paper on Meridian Marks for Transit Instruments. By Captain Noble.

With reference to the idea advanced by Mr. Crossley in his paper in the April number of the *Monthly Notices*, it may perhaps be worth mentioning that Maskelyne employed a cap with a lens of long focus, to slip over the object-glass of his transit, eighty or ninety years ago. He would appear to have derived his original notion from a Dr. Rittenhouse. Vide Smyth's *Celestial Cycle*, vol. i. (Prolegomena), p. 331.

On the Motion of Equatoreals in Right Ascension. By Wentworth Erck, LL.D., F.R.A.S.

Knowing the inconvenience most observers suffer from the uncertain movements of their instrument in right ascension, I desire to draw attention to two errors commonly committed in the transmission of the driving power from the clock to the polar axis, and to describe a new and very much simplified form of slow motion.

The power is usually communicated by a tangent-screw working in a circle, or sector, attached to the polar axis.

In order to prevent any play of the telescope in right ascension, both the tangent-screw itself must be free from end motion, and also the teeth of the sector must not have any power of moving in the thread of the screw.

The former condition is generally secured by causing the screw-shaft to work in V collars; the latter by having the thread of the screw of a V section, and keeping the screw pressed home by a spring into the teeth of the sector; or else by adjusting the distance of the screw from the centre of the circle so accurately that there shall be no play between the sector and the screw.

Both plans are objectionable: the spring, because it further requires that the screw should have a motion enabling it to alter its distance from the circle, and also because a very small pressure unintentionally applied to the end of a large telescope will suffice to overcome the pressure of the spring, when the screw, acting as a rasp on the teeth of the sector, will soon destroy them.

The other plan is far stronger and stiffer, but is also open to two objections:—

One is the great and uncertain friction inevitably attendant on the use of V collars; the uncertainty arising both from the uncertain degree to which the collars may be tightened up, and also the condition of the lubricating oil.

The other objection is the practical impossibility of so adjusting the distance of the screw from the circle as to prevent play without jambing the screw; and, even admitting the possibility of doing this for a single position of the circle and the screw, this will by no means suffice, for the adjustment must continue perfect for all positions of the circle and of the screw, which implies the absolute freedom from excentricity of both the circle and the screw, and also that the teeth of the circle shall be all of precisely the same depth.

To accomplish this in the case of a circle, and still more in the case of a sector, with deep teeth, would be, if not an impossibility, at least a most difficult work.

The instrument-makers tell us that the mere dividing of a circle with faint lines is no easy matter: how much more difficult would it be to cut out accurately every second space of 10′ to exactly the same depth all round.

Yet, if there be not this perfect freedom from excentricity in the screw, the sector, and the polar axis, there must be either motion between the sector and the screw, or else there will at times be applied to the screw the very most powerful form of clamp known, viz. a number of V teeth driven into V rings, producing a resistance which no clock could overcome.

The other common mistake alluded to consists in having several revolutions of the thread round the axis of the screw. These are not only useless, but injurious.

For, as the screw is a tangent to the circle, the intersections of the teeth of the circle with the thread of the screw will be the points where the secants of equal angles cut the tangent; but these spaces are constantly increasing from the centre toward each end of the screw, whereas the spaces between the revolutions of the thread are equal: therefore the central and extreme revolutions of the thread cannot fit the equal teeth of the sector, and, not fitting, they will jamb irregularly, and so tend to destroy each other.

There should be only three complete revolutions of the thread, the central revolution being at the point of contact of the circle with the tangent: in this case there will be always three teeth bearing uniformly against three revolutions of the thread.

All these difficulties I have avoided by using a square-threaded screw, working in a sector with square teeth. There is no attempt at fitting the teeth to the screw—if they did fit, they would soon wear loose—but the teeth of the sector are kept in close contact with the thread of the screw by a strong catgut band attached to the west end of the sector; which band, after passing round the circumference of the sector in a groove prepared for its reception just under the projecting teeth, and also passing over a fixed pulley in the plane of the sector and to the east thereof, carries at its other end a weight of about 20 lbs.

Thus there is no possibility of unintentional motion of the telescope in right ascension.

Further, the required motion in right ascension is produced by the weight aforesaid acting directly through the catgut band on the sector itself; so that the clock is not employed to move the telescope at all, but only to regulate, by the revolution of the screw, the rate at which the said weight shall move the telescope. This weight must be sufficient, not only to move the telescope, but also to overcome the pressure of a strong west wind against its upper end.

The slow motion in right ascension in my instrument is effected in the following manner:—

The driving-screw has a traversing motion, through plain collars, in the direction of its own length, to the extent of half an inch. The eastern end of the screw-shaft terminates in a hard steel knob, which abuts against the flat end of a large fine-threaded screw attached to a suitable part of the pedestal; and it

is always kept in contact with the said screw by the weight already mentioned acting on the driving-screw through the sector. Thus the smallest motion of the fine-threaded screw will be immediately responded to by the driving-screw, sector, and polar axis.

This fine screw is easily turned from any part of the observatory by means of cords passing over wheels on the end of a spindle connected by a pair of cog-wheels with the fine screw.

One turn of these wheels corresponds to thirty seconds of time; so, the edge of the wheel being divided, you can with the greatest ease and accuracy measure small differences of right ascension up to eight or ten minutes of time; while the motion is so smooth and reliable that you can split a star on the line almost quite as well and as certainly with the right ascension slow motion as with the micrometer-screw.

This apparatus has now been in use upwards of three years, during which it has received but little care or attention; yet I have never once, under any circumstances, been disappointed in the immediate starting, and constant rate, of the driving-machinery.

In the ordinary form of construction the reserve-power of the clock is liable to be used up in overcoming internal resistance in the machinery; whereas in the new form the entire reserve-power of the clock (which is about four times that absolutely necessary to move the instrument) is available to overcome external resistance.

In order to try the effect on the rate of a considerable resistance, I turned the telescope to P.D. = 90 and R.A. = 6 hrs.: in this position 14 lbs. attached to the telescope at a distance of 54 inches from the declination-axis did not produce a change of 10 seconds per hour in the rate; while the friction of the whole machinery is so little that, although the moving parts weigh 8 cwt. a weight of 12 lbs., descending an inch per minute, sufficed to drive the clock and all attached machinery.

Sherrington Bray, Co. Wicklow,
19 *May*, 1873.

On a New Method of Observing the Transits of Venus. By Richard A. Proctor, B.A. (Cambridge).

Mr. E. L. Garbett has communicated to me his views respecting a method of observing the approaching transits of *Venus*, which appears to offer considerable advantages. I hope to obtain from him, for our Supplementary Number, a full description of the method and its characteristics. For the present it may suffice to mention that he suggests the application of photography with